

PATENT SPECIFICATION



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PROVISIONAL SPECIFICATION.

Improvements in Internal Combustion Engines.

I, CYRIL JOSEPH BARNFORD, a subject of the King of Great Britain, of The Parks, Uttoxeter, in the County of Stafford, do hereby declare the nature of this invention to be as follows:—

This invention relates to internal combustion engines of the kind having overhead valves operated by levers or rockers.

In engines having valves arranged in this manner it has been customary to operate each of the valves through the medium of a two armed rocker lever having one end pushed upwardly so that the other end moves downwardly to open the valve.

This construction occupies most of the space above the combustion head and precludes the possibility of fitting an ignition plug in the head of the combustion chamber.

The present invention provides improved valve operating mechanism which enables lighter operating parts to be used and in addition leaves room for the fitting of an ignition plug in the combustion head preferably at or near the centre thereof.

In accordance with one of the features of the present invention in order to allow of the sparking plug being inserted in the cylinder head one (or in some cases both) of the valves is operated by a rocker or lever having a single arm instead of using a two armed lever or rocker as is usual.

The omission of one of the arms of one or both of the rockers leaves a sufficiently clear space in the cylinder head for the insertion of the sparking plug in any suitable position.

In one construction the end of the combustion space is domed and part spherical or otherwise suitably shaped and the two valves are arranged with their axes inclined to the axis of the cylinder so that they are directed towards the centre of the combustion space.

The valve stems thus diverge and their outer ends are consequently a considerable distance apart. Both valves may be operated by single armed rocker levers.

In this arrangement the two rocker levers are provided with separate pivots

both pivots being offset from the centre of the cylinder so that a space is left between them for the insertion of the sparking plug which in this case can be arranged axially with respect to the cylinder.

In this arrangement each rocker lever engages its valve stem intermediate its ends and it may be provided with an adjustable set screw the end of which engages the valve stem.

Both of such rockers may be operated by pull rods and for operating these pull rods I may provide two separate cam shafts in the crank case of the engine each cam shaft having a cam which operates a pull rod either through the medium of a ball crank lever or through the medium of a stirrup or through the medium of a half stirrup.

The valve springs may be relied upon for the return movement of the pull rods or additional springs co-operating with the pull rods or with the rocker arms may be provided if required.

If required, either or each of the rocker levers may be of laminated spring construction. Such levers may be anchored at their inner ends and their outer portions may engage their respective pull rods so as to apply initial tension thereto.

If required, such laminated spring rocker levers may in addition engage the valve stems in such manner as to enable the usual valve springs to be dispensed with.

The inlet and exhaust valves of the cylinder may be operated by separate one armed laminated spring rocker levers or if required a single laminated spring rocker lever may be provided for operating both valves. Such a rocker lever may extend across the combustion head and may either be fixed or pivoted at a point intermediate its ends.

The two ends of such a rocker lever may be attached to pull rods arranged on each side of the crank case and the two arms of such a rocker lever may engage the inlet and exhaust valve stems and if required may be connected thereto in such manner that separate and indepen-

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dent valve springs are unnecessary.

In any of the arrangements hereinbefore described the valve gear may be enclosed and provided with a detachable cover to allow of access being obtained to the valves.

It will be obvious that instead of arranging the inlet and exhaust valves in inclined positions on either side of the cylinder axis they may be arranged on one side with their stems either verti-

cal or inclined outwardly and each operated by a single armed lever operated by a pull rod.

Dated the 29th day of November, 1927.

FORRESTER, KETLEY & Co.,

Chartered Patent Agents,

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Jessel Chambers,

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COMPLETE SPECIFICATION.

Improvements in Internal Combustion Engines.

I, CYRIL JOSEPH BARNFORD, a subject of the King of Great Britain, of The Parkes, Uttoxeter, in the County of Stafford, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to internal combustion engines of the kind having overhead valves operated by levers or rockers and in which each valve is operated by means of a separate pull rod through the medium of a single armed rocker.

In one such construction each rocker was in the form of a laminated spring rigidly secured at one end to the induction pipe.

The primary object of the present invention is to provide valve mechanism which will take up less space above the combustion head and enable an ignition plug to be fitted substantially centrally of the combustion chamber.

In accordance with the present invention I provide valve mechanism for internal combustion engines comprising the combination with a cylinder head of domed or conical form having a central opening or a substantially central opening for a sparking plug, of valves arranged with their stems in diverging relationship, each valve being actuated by means of a separate pull rod and a single armed rocker.

A further feature of the present invention is to operate each pull rod from a separate cam shaft through the medium of a bell crank lever.

Each rocker may be in the form of a single arm either of a rigid or flexible construction or if desired the rocker may be in the form of a spring anchored at its centre and connected at each end to a pull rod controlling a single valve the intermediate parts of the spring between its centre and its ends operating either directly or through the medium of a separate member upon the extremity of

a valve stem.

In order that my invention may be clearly understood and more readily carried into practice I have appended herewith two sheets of drawings illustrating the same wherein:—

Figure 1 is a sectional view in side elevation showing one form of the invention.

Figure 2 is a sectional plan view.

Figure 3 is a sectional view illustrating a modification.

Figure 4 is a sectional view in side elevation showing another form of the invention.

Figure 5 is a sectional view on line 5—5 of Figure 4.

In the construction illustrated in Figures 1 and 2 the end of the combustion space 1 is domed or part spherical or conical and the two valves 2 and 3 are arranged with their axes inclined to the axis of the cylinder so that they are directed towards the centre of the combustion space.

The valve stems 4 and 5 thus diverge and their outer ends are consequently a considerable distance apart.

Both valves are operated by single armed rocker levers 6 and 7.

In this arrangement the two rocker levers 6 and 7 are provided with separate pivots 8 and 9 both pivots being offset from the centre of the cylinder so that a space is left between them for the insertion of the sparking plug 10 which is arranged axially with respect to the cylinder.

In this arrangement each rocker lever engages its valve stem intermediate its ends and it may be provided with an adjustable set screw 11 the end of which engages the valve stem.

Both of such rockers are operated by pull rods 12 and for operating these pull rods I may provide two separate cam shafts 13 in the crank case 14 of the engine each cam shaft having a cam 15 which operates a pull rod through the

medium of a ball crank lever 16.

The valve springs 17 may be relied upon for the return movement of the pull rods or additional springs co-operating with the pull rods or with the rocker arms may be provided if required.

If required, either or each of the rocker levers may be of laminated spring construction. Such a construction is shown in Figure 3 wherein the lever 18 is anchored at its inner end by a U shaped clip 19 to a lug 20 on a cover member 21 and its outer portion engages its pull rod. The lever 18 may be under initial stress, i.e. when the valve is closed, so as to keep the ball crank lever on its cam.

In the construction shown in Figures 4 and 5 the invention is shown applied to a two cylinder engine each cylinder having two valves 22 and 23 arranged similar to those shown in Figure 1 so that there is space between them for a sparking plug 24.

In this construction each pair of valves 22, 23 is operated by a single member 25 of laminated form comprising in effect two single-armed rockers which are operated by means of pull rods 26 and 27 actuated by bell crank levers 28 and 29 operated by separate cams 30 and 31.

In this construction there is a member 25 for each cylinder and each of the members 25 is riveted or otherwise attached to a plate 32 forming part of a pin 33 the pin being grooved as shown at 34.

Each cylinder head is provided with a housing 35 for the two pins 33 and the two pins are flanged as shown at 36 and retained in position by transverse bolts 37 engaging in the grooves 34.

The pins 33 can thus make a turning movement in their housing if required.

In operating the two halves of each member 25 are moved at different times so that there will be very little if any rocking movement of the pins 33.

The valves 22 and 23 are provided with stems 38 which pass through slots in the upper plate 39 of the member 25 and through slots in the attachment piece 40 riveted to the ends of the rockers the valve stems 38 being provided with a reduced portion 41 to engage in these slots and with a head 42.

The valve stems are thus permanently attached to the rockers and as the rockers are under initial stress the usual valve springs may be omitted, the rockers serving to close the valves and also to open them positively when the rockers are rocked.

In any of the constructions herein described the valve operating mechanism or

any part thereof may be enclosed or partially enclosed in covers such as 21 or 43 such as are shown in Figure 1.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Valve mechanism for internal combustion engines comprising the combination with a cylinder head of domed or conical form having a central opening for a sparking plug, of valves arranged with their stems at diverging relationship, each valve being actuated by means of a separate pull rod and a single armed rocker.

2. Valve mechanism for internal combustion engines including two or more valves having their stems arranged in diverging relationship each valve upon opposite sides of the cylinder head being operated by means of a single armed rocker controlled by means of a separate pull rod, the rockers being spaced apart upon opposite sides of the head to allow of the insertion of a sparking plug centrally or substantially centrally of the cylinder head between the valves.

3. Valve mechanism for internal combustion engines including two or more valves having their stems arranged in diverging relationship, each valve upon opposite sides of the cylinder head being operated by means of a separate pull rod through the medium of a rocker arm in the form of a resilient spring secured at its centre to the cylinder head.

4. Valve mechanism according to Claim 1 or 2 wherein each rocker arm is in the form of a laminated spring firmly anchored at one end to the cylinder head or a part associated therewith and pivotally connected at the opposite end to a pull rod the intermediate part of the rocker arm bearing either directly or through the medium of an associated part upon the extremity of a valve stem.

5. Valve mechanism according to any of the preceding claims wherein each pull rod is operated from a cam shaft through the medium of a ball crank.

6. Valve mechanism for internal combustion engines substantially as described with reference to Figures 1 and 2 or Figure 3 or Figures 4 and 5 of the accompanying drawings.

Dated the 22nd day of August, 1928.

FORRESTER, KETLEY & Co.,

Chartered Patent Agents,

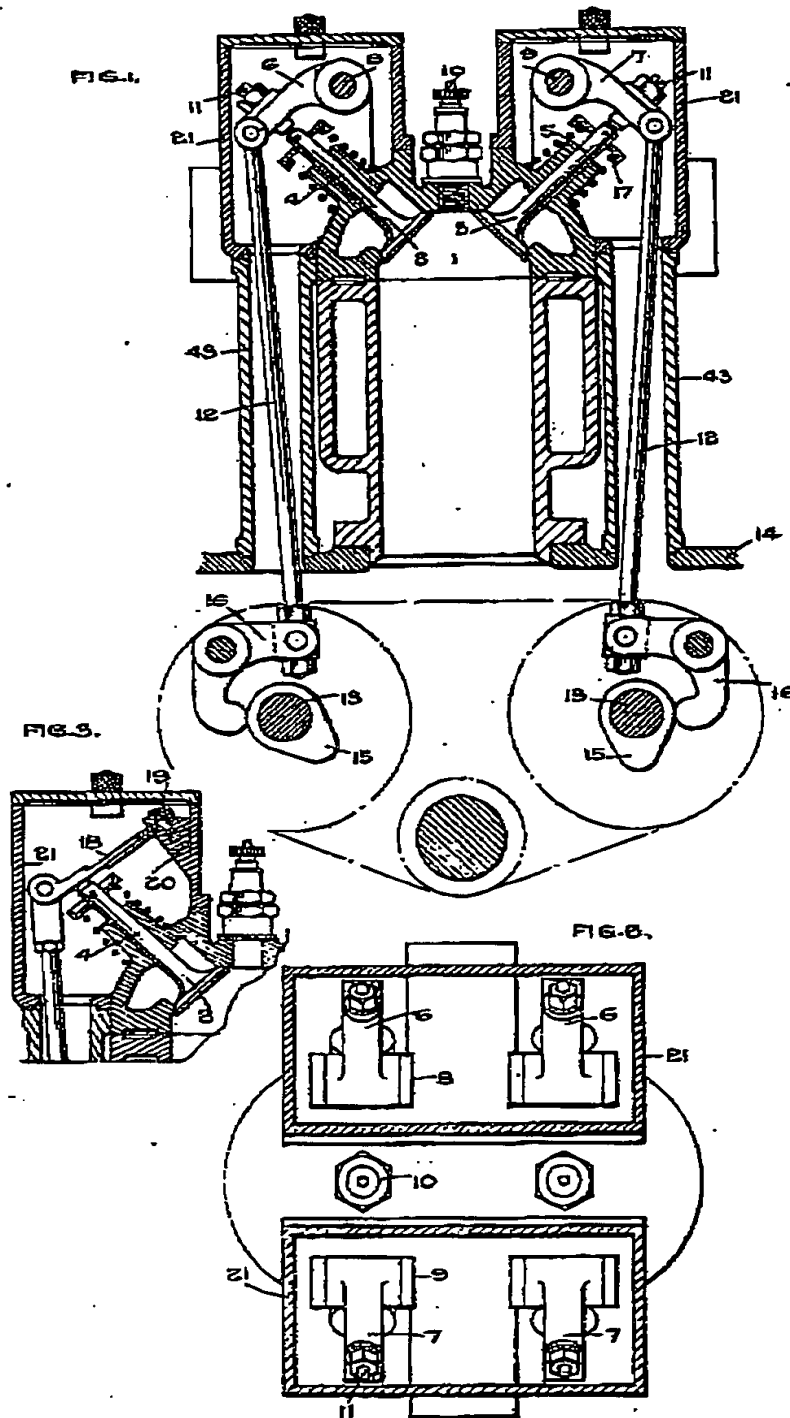
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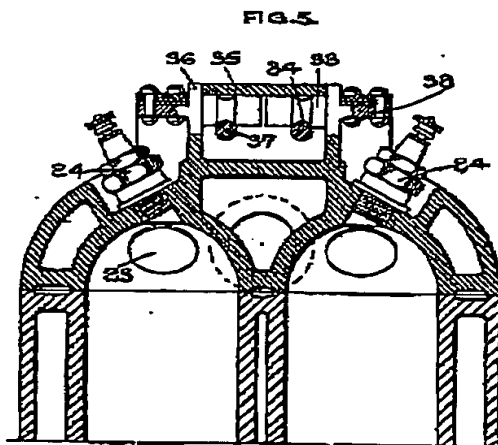
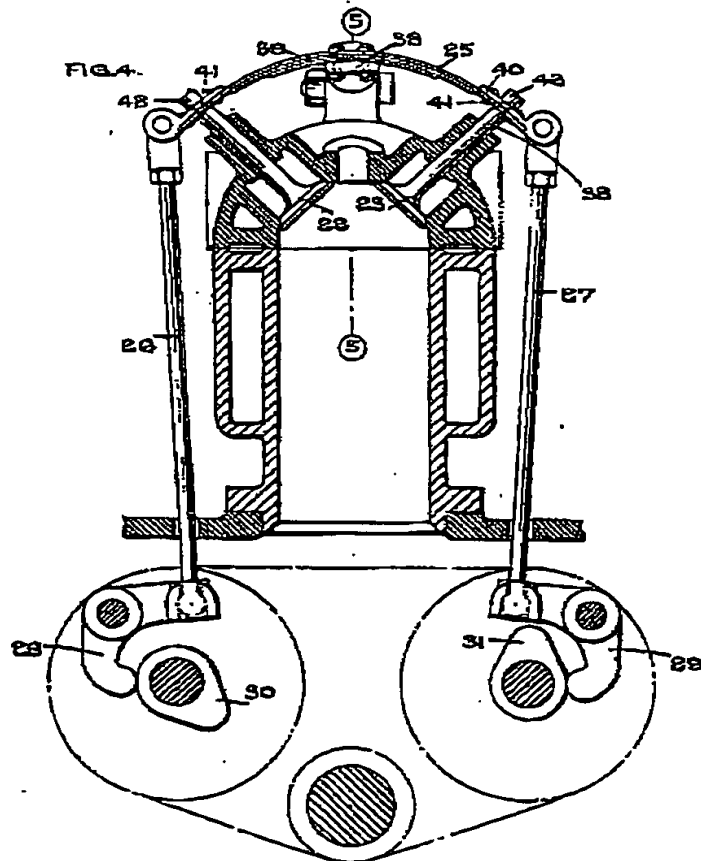
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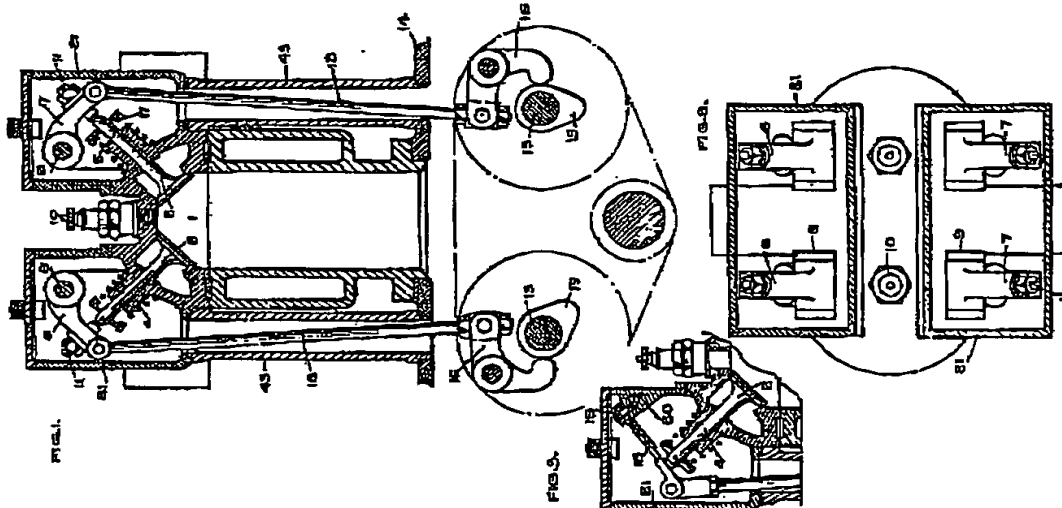
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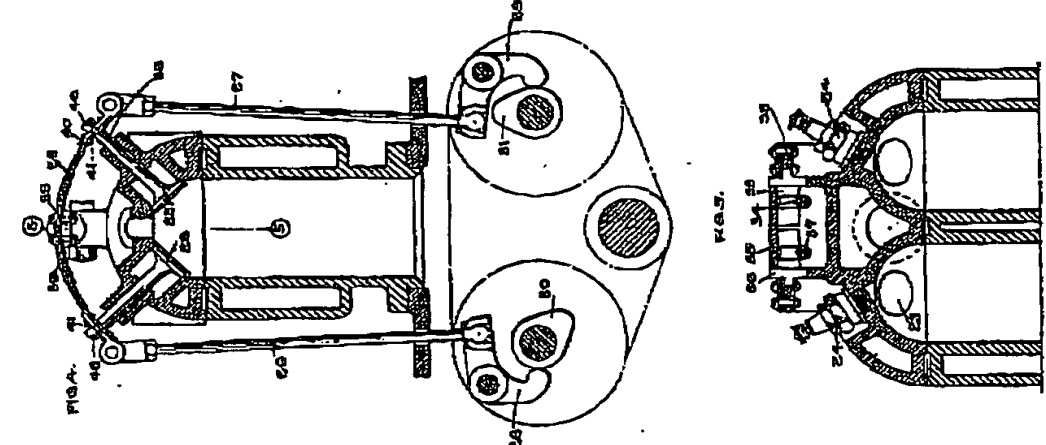
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Honda Giken Kogyo Kabushiki Kaisha

NEW CLAIMS

1. A valve system for an OHV-type four-cylinder internal combustion engine comprising a pair of cylinder banks (CB1, CB2), which are disposed symmetrically on opposite sides of an imaginary line (L2-L2) orthogonal to the axis line (L1-L1) of a crankshaft (1) and are extended roughly horizontally in a left-right direction, wherein each of said cylinder banks (CB1, CB2) comprises integrally a crankcase portion (2L, 2R) for rotatably supporting said crankshaft (1), a cylinder block portion (3L, 3R) on the outside of said crankcase portion (2L, 2R), and a cylinder head portion (4L, 4R) on the outside of said cylinder block portion (3L, 3R), and wherein valve-operating members (18i, 18e) for operating intake and exhaust valves (14, 15) for opening and closing intake and exhaust ports (12, 13) of combustion chambers (11) are provided at said cylinder head portions (4L, 4R), characterized in that intake and exhaust valve camshafts (26i, 26e) operating in connection with said crankshaft (1) are rotatably supported at said crankcase portions (2L, 2R), wherein said intake and exhaust valve camshafts (26i, 26e) are disposed respectively on both sides of said crankcase portions (2L, 2R) on the vertical imaginary line (L2-L2) with said crankshaft (1) therebetween, and oscillating arms (39i, 39e) operating in connection with said valve camshafts (26i, 26e) and said valve-operating members (18i, 18e) for operating said intake and exhaust valves (14, 15) are respectively connected to each other through pull rods (20i, 20e) disposed on both lateral sides of said cylinder banks (CB1, CB2),

wherein said pull rods (20i, 20e) are connected to tip ends of the valve operating members (18i, 18e) which are shaft-supported on the cylinder head portions (4L, 4R), and

wherein the tip ends of the valve operating members (18i, 18e) are furthermore provided with slipper surfaces for operating said intake and exhaust valves (14, 15).

2. A valve system for OHV-type four-cylinder internal combustion engine as set forth in claim 1, wherein
intake and exhaust valves (14, 15) are arranged V-type and covered by head covers (24) disposed on top surfaces of the cylinder head portions (4L, 4R).